MINE WARFARE:

The Key to Assured Access

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One of the goals of reorienting the global posture (of the United States) is to render forward forces capable of swiftly defeating an adversary's military and political objectives with only modest reinforcement. Key requirements for this reorientation include new combinations of immediately employable forward stationed and deployed forces; expeditionary and forcible entry capabilities….

Quadrennial Defense Review Report
September 30, 2001[1]

The 2001 Quadrennial Defense Review Report, which provides defense planning guidance for the next several years, emphasizes the importance of forward-deployed naval expeditionary forces and their ability to assure access to the world's littoral regions. However, before this access can be "assured," America's naval services must deal with a broad array of challenges posed by our potential adversaries. In particular, they will be called upon to defeat adversary access-denial strategies that often will be "asymmetric" in character. Using weapons and platforms such as diesel-electric submarines, ballistic missiles, cruise missiles, mines, concealed shore batteries, small boats and craft, and a host of others, these hostile nations and groups will attempt to raise the cost of U.S. intervention to intolerable levels.

Together or separately, these asymmetric threats have the potential to deny or delay U.S. access to important littoral areas. These threats can be eliminated or reduced – the Navy and Marine Corps have already invested significant resources and intellectual capital to counter many of these threats. In fact, the structure of most naval battle formations is built around the offensive and defensive capabilities required to project power while simultaneously dealing with various access-denial threats.

Ironically, however, it is the relatively low-technology mine threat that poses one of the most serious challenges to U.S. assured access. Our naval forces are organized, trained, and equipped to engage in the full spectrum of military operations from the open ocean, to the littoral, to inland areas, but they do not yet have a decisive counter to sea mines. In the hands of hostile forces, mines remain a threat to the mobility and freedom of action of America's naval forces.

This has serious repercussions for the U.S. ability to project a full range of combat power. U.S. naval expeditionary operations are based upon the principles of *Operational Maneuver from the Sea* (OMFTS), which emphasizes the use of the sea as an avenue for projecting force against key enemy objectives ashore. Sea mines can thwart this kind of action by creating restricted areas where U.S. naval forces cannot go. Likewise, they can impede the arrival of critical joint reinforcements that travel via sealift – such as combat equipment, ammunition,

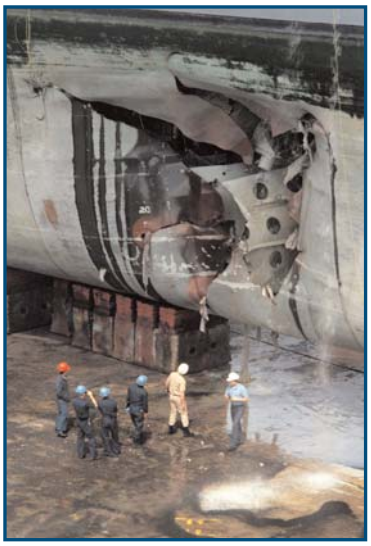
supplies, and fuel prepositioned on board ships – into a theater of operations. Used tactically, mines can slow or stop surface combatant and sealift movement through narrow straits, or the movement from amphibious warships to landing zones ashore. In doing the latter, they also make naval surface forces and amphibious assault craft more vulnerable to other shore-based threats.

Combating this threat requires an integrated approach to countermine warfare, one that balances the mix of special- and general-purpose forces and capabilities. It also demands extensive C4ISR (command, control, communication, computer, intelligence, surveillance, and reconnaissance) capabilities. And it requires a common understanding of mine threats and how to counter them throughout the Fleet and Fleet Marine Force. Without these, Navy and Marine Corps operations can still be held hostage by an enemy's "weapons that wait."

An Ongoing Challenge

Their availability, variety, cost-effectiveness, ease of deployment, and potential impact on naval expeditionary operations make mines – "a poor man's naval force" – one of the most attractive weapons available to any adversary determined to prevent U.S. and coalition forces from achieving littoral access to project power ashore. During the last half of the 20th century, U.S. adversaries and other nations have used mines extensively to deny – at least for a time – access to significant sea areas. They placed mines in choke points to interrupt sea commerce and naval operations, in the sea approaches to harbors, and in areas of likely amphibious assault.

In the last several decades, rogue states have used mines in indiscriminate, and sometimes unconventional, ways. Libya used mines to disrupt commerce in the Gulf of Suez and the Strait of Bab el Mandab. Iran laid mines to disrupt military and commercial traffic in the Persian Gulf and the Gulf of Oman. During Operation Desert Storm a decade ago, the threat of mines complicated planning for an amphibious assault on the shores of Kuwait and threatened all U.S. and coalition ships operating in the Persian Gulf. Iraqi mines heavily damaged two Navy warships – the cruiser *Princeton* (CG-59) and the amphibious assault ship *Tripoli* (LPH-10) – effectively removing them from subsequent operations. Moreover, the hazard posed by Iraqi mines was so extensive that clearance operations in this relatively confined body of water were not completed until the late 1990s.



Ultimately, U.S. and allied forces were successful in defeating these past mining challenges so that joint and combined operations could proceed. Accomplishing this, however, required the use of a large number of U.S. and allied platforms and assets and took a relatively long time. It is unlikely that U.S. and allied forces will have these operational luxuries in future conflicts.

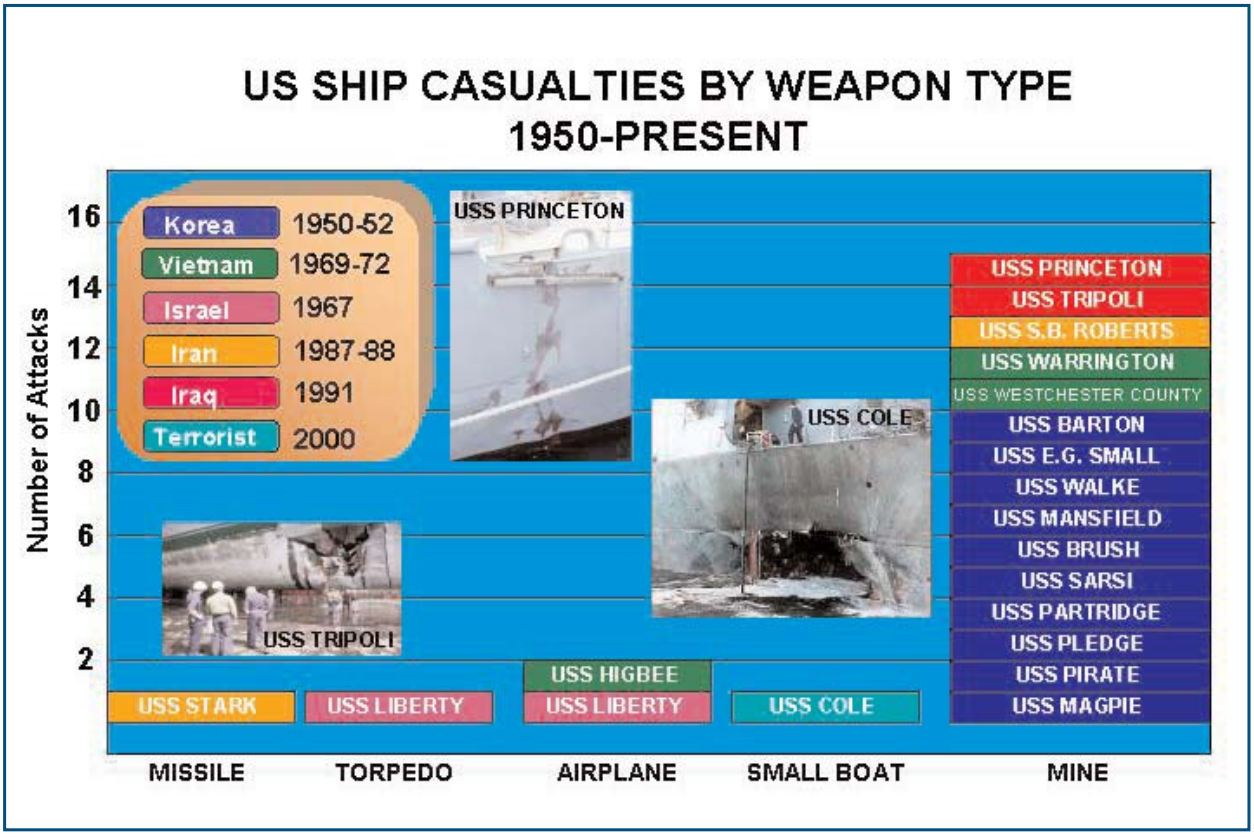
Today, the threat posed by adversary mining capabilities is growing. The number of countries with mines, mining assets, mine manufacturing capabilities, or the ability to export mines, has grown dramatically in the last decade. More than 50 countries currently possess these weapons, a 40 percent increase since 1986. Of these, at least 30 countries have demonstrated a mine-production capability, and 20 have attempted to export them.[2] In addition, the types, sophistication, and lethality of the mines available on the world market are rapidly increasing. This has been compounded by the availability of former Soviet bloc expertise in mining technology and employment.

This daunting mine challenge is affecting U.S. naval activities across diverse geographic areas and operational environments. Even in peacetime, the Navy and Marine Corps must collect intelligence on the location and status of these foreign mine inventories – information that would be of immediate operational interest during a crisis or contingency. U.S. naval forces also collect, store, and catalogue data obtained by their mine-hunting sonars during exercises and routine operations. In wartime, they would use this accumulated environmental data to compare current and historical bottom features for the presence of new mine-like bottom objects. Changes in this data may indicate enemy mining activities.

During hostilities, naval expeditionary forces must be able to deal with mines in both inshore waters (less than 40 feet depth, including the surf zone and the craft landing zone where amphibious assault vehicles put ashore) and deeper, offshore waters. The offshore mine threat affects the ability of carrier battle groups and amphibious task groups – as well as sealift and commercial shipping – to maneuver in and use specific areas.

The inshore threat affects the ability of tactical amphibious lift such as the Advanced Amphibious Assault Vehicle (AAAV) or the Landing Craft, Air Cushion (LCAC) to bring combat power ashore. The inshore threat also affects U.S. ability to unload combat equipment and supplies in overseas ports or to conduct over-the-shore offloads onto a secured beach.

No matter what the circumstance or location, all of the Navy's mine countermeasure activities are critical to the ultimate defeat of enemy mine strategies. In short, the United States ignores mine warfare at its own peril.



Mine Countermeasures:

A Capability in Transition

A decade ago, the Navy's experience in the Gulf War and afterward, once again rekindled interest in mine warfare. This interest increased even more in 1996 when a Chief of Naval Operations white paper, *Mine Countermeasures – An Integral Part of Our Strategy and Our Forces*, ordered a transformation in the way the Navy approached mine warfare. In an attempt to improve the speed in which the service responded to mine threats, the new vision called for the integration of new MCM assets into all naval battle forces at sea, rather than leaving them exclusively in the domain of a separate, dedicated force. The vision also emphasized the need for balance between these "organic" capabilities and dedicated forces, as well as a new "mine awareness" throughout the Fleet.

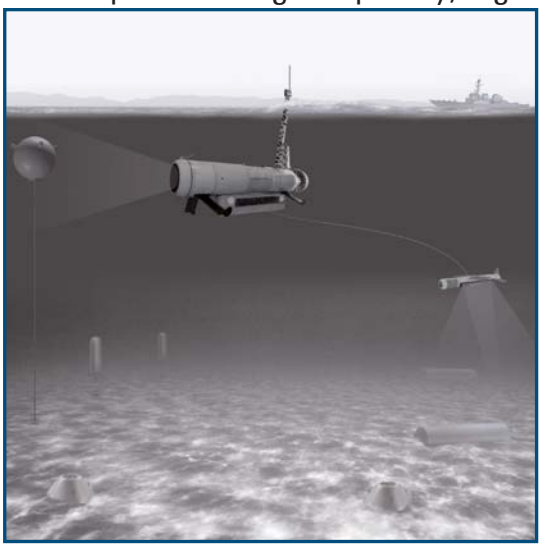
The New Approach

To achieve the ability to project power ashore, U.S. naval expeditionary forces must be able to locate, neutralize and eliminate mines, identify those areas where mines are not present, and determine where their underwater sensors can operate most effectively in the counter-mine role. The mine threat can either be avoided or eliminated by physically clearing mines. Additionally, Navy and Marine Corps forces can destroy mine stockpiles preemptively, prevent mines from reaching the mine-laying platforms, or destroy the mine-laying platforms them-

selves, although pre-conflict political considerations can preclude this more proactive course. At the very least, however, U.S. forces can collect information on the movement and deployment of mines for use in later clearance operations.

In the last half of the 20th century the United States' usual response to an enemy or terrorist mine threat was to deploy dedicated MCM forces – a triad of surface mine countermeasures ships, mine countermeasures helicopters, and Explosive Ordnance Disposal (EOD) teams. While airborne mine countermeasures forces (AMCM) and EOD MCM detachments had the ability to deploy rapidly, they often competed with other expeditionary forces for available airlift. This made their arrival times uncertain, a factor that complicated the efforts of those planning the mine countermeasures campaign. Even worse, the transit speeds of U.S. surface mine countermeasures (SMCM) forces – the MCM ships that are the workhorses of any countermine operation – are slow. Therefore, it made little difference from which ports in the United States they deployed, or whether they were transported by heavy-lift vessels or sailed on their own. No matter what the circumstances, they could not reach an area such as the Persian Gulf for several weeks at best.

To offset this weakness, the Navy has forward-based MCM forces in Japan and Bahrain to reduce the transit times of these dedicated assets. More significantly, the naval services are pursuing the capability for combatants that are not escorted by MCM ships to rapidly assess and neutralize – albeit in a limited fashion – the adversary mine threat. This capability will be built around "organic" MCM systems, assigned to forward-deployed carrier battle groups (CVBGs) and amphibious ready groups (ARGs), that will begin entering the fleet by mid-decade. Referred to as a "punch-through" capability, organic MCM assets permit deployed naval forces to begin their countermine campaign during the early days of any joint operation. Punch-through capabilities do not eliminate the risk from mines or necessarily allow operations to proceed completely uninterrupted or without pause, but they do provide an immediate means to better assess the mine risk and minimize operational delays.



Consequently, as organic systems are fully fielded towards the end of this decade, a transformed Fleet MCM capability will augment the existing MCM triad. In effect, a "new triad" – consisting of organic MCM systems, overseas-based MCM forces, and the U.S.-based dedicated MCM force – will provide U.S. joint commanders with the means, in depth, to accomplish the MCM mission.

"Mainstreaming" Mine Warfare

If this new mine warfare concept is to be successful, however, the commanders, staffs, and sailors of Navy carrier battle groups and amphibious ready groups must embrace mine countermeasures as a core competency. Thus, a key part in the Navy's mine warfare transformation is the process of "mainstreaming" – bringing existing MCM operational knowledge and understanding into naval force planning as a matter of course and preparing battle group staffs for the forthcoming introduction of their own organic countermine systems.

Along with the development of a new family of organic MCM equipment, the Navy has established a Fleet Engagement Strategy to promote mine warfare in the areas of doctrine, organization, training, materiel, leadership and education, people, and facilities. The strategy will facilitate the integration of this new equipment into the fleet while simultaneously educating the naval services as to how and why mine warfare needs to be a fleet-wide competency, in parity with strike, surface, and undersea warfare.

The Navy reached an important milestone in this context in 2001 when the Commander in Chief, U.S. Atlantic Fleet (CINCLANTFLT) signed and implemented a new *Mine Warfare Concept of Operations* for forward-operating CVBGs and ARGs. For the first time, this concept of operations directed that control of organic MCM assets be vested in Mine Warfare Commander (MIWC), who serves as a principal warfare commander for all MCM matters for the battle group or task force. Significantly, the MIWC will have elevated visibility and access within the CVBG or ARG command structure.[3]

The CINCLANTFLT's mine warfare concept of operations also defines the operational environment associated with organic mine warfare activities, establishes responsibilities for command and control, and provides a basic concept for employment of new and potential organic MCM systems. It strongly emphasizes that these organic capabilities are not intended to be a replacement for the Navy's dedicated MIW forces, but instead, are complementary systems developed to enhance the fleet's rapid-response capability.

The MCM Operational Framework

The Navy's recent mine warfare initiatives fit into a broader framework. For example, the Commander, Fifth Fleet has categorized countermine warfare into five operational phases:

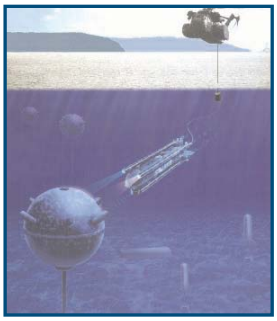
1. Intelligence collection and surveillance,
2. Indications and warning of imminent mining,
3. Interdiction, both on land and at sea,
4. Post-interdiction intelligence evaluation and dissemination, and
5. Mine countermeasures.

In this framework, the first four phases mainly focus on preventing mines from being deployed (although, as is discussed later, intelligence and surveillance are critical to all aspects

of countermine warfare). As noted, the naval expeditionary forces may be able to reduce or eliminate the mine threat they face by pre-emptively attacking enemy mine warfare assets at their source. Carrier battle groups can attack mine stockpiles and mine-laying ships and craft with tactical aircraft and cruise missiles. Amphibious ready groups can use Marine Air-Ground Task Forces (MAGTFs) to raid or seize the ports of debarkation of mine-laying ships. This kind of action requires the support of a full spectrum of intelligence assets. It also requires the involvement of major warfare commanders who are knowledgeable about the mine threat and mine operations.

However, broader political or military considerations may eliminate the option of pre-empting enemy mining, requiring U.S. forces to implement defensive mine countermeasure plans. Currently, CVBGs and ARGs deploy with the capabilities to plan and execute the first four phases of countermine warfare. But – short of MCM signature control – today's battle groups have a very limited capacity for conducting mine countermeasure operations, forcing them to rely heavily on dedicated forces. This situation must and will change dramatically as new organic systems enter the fleet.[4]

The Initial "Punch-Through" Capability



In the future, if attempts to forestall or thwart enemy mining actions are unsuccessful, CVBGs and ARGs will use the organic MCM assets assigned to them to see and avoid mines and, if necessary, conduct limited clearance operations. The idea behind the employment of these organic assets is not to pursue the deliberate and cumulative destruction of mines. Rather, carrier battle groups and amphibious ready groups will employ all-source intelligence and their organic mine-locating systems to locate and avoid mines altogether. If mines are located but cannot be effective-

U.S. Naval Mining

A less visible capability, but one that has equal importance in future expeditionary operations, is the U.S. Navy's own ability to deploy a modern family of sea mines optimized for use in littoral regions. The strategic employment of mines is a classic low-cost force multiplier that takes on special importance at a time of declining fleet size.

Traditionally mines have been viewed as weapons of unrestricted, full-scale warfare, targeted at enemy shipping. However, these weapons can also be useful in other circumstances, such as when economic sanctions or a blockade is imposed on a hostile nation. They can also be used to control the movement of single ships or to close off a specific sea area to all traffic. Used defensively, minefields can protect friendly areas by maintaining a barrier against enemy surface ships or submarines. Mines can also prevent an adversary's warships from leaving or returning to port. And, when provided to allies, they can be an effective way of providing U.S. naval support short of direct intervention.

Despite the success of mining campaigns throughout the latter half of the 20th century, the viability of the U.S. Navy's mining capability is questionable, mainly due to its aging stockpile of sea mines. To regain and retain its once significant mining abilities, the Navy will need to modernize its inventory of mines by developing a new family of remotely controlled underwater weapons, a standoff mining capability, and a full-water-depth mining capability. The service also will have to ensure that its mines can be delivered by a full range of platforms, including aircraft, surface ships, and submarines. And, as is the case with MCM, the service also will have to integrate mining operations into almost every part of its overall operational planning.

ly neutralized or destroyed quickly enough, naval forces may maneuver through gaps in enemy minefields while simultaneously employing point-defense measures – such as acoustic and magnetic signature control – to provide close-in, own-ship protection.

The MCM capability assigned to a CVBG or ARG will be built around a wide range of systems. These include surface ship combat systems such as the Remote Minehunting System; submarine combat systems such as the Long-Term Mine Reconnaissance System; the MH-60S helicopter equipped with mine detection, neutralization, sweep and clearance systems; and Explosive Ordnance Disposal (EOD) Detachments and Combat Systems.[5] Taken together, these organic systems provide the CVBG and ARG with the ability to begin dealing with the mine threat immediately while they await the arrival of dedicated forces from forward bases or the United States. Those forces bring both traditional and emerging systems to bear to deal more fully with the mine threat.

Bringing the Full Spectrum of Mine Countermeasures to Bear

While the organic MCM capabilities of our CVBGs and ARGs are capable of dealing with a limited mine threat, a full national – and in some cases allied – MCM capability must be brought to bear in order to deal with larger, more complex mine challenges. While some of these assets may be deployed to standard fleet operating areas or to areas of concern prior to a full-blown crisis erupting, the majority of these forces must be surged from the continental United States.

The organic MCM capabilities of the CVBG and ARG can serve as force multipliers for those dedicated assets as they surge forward from the United States. On-scene forces will already have a basic MCM capability and will have assessed the environment and threat situation before dedicated forces even deploy. Additionally, if they are not required for other missions, organic assets can also augment the dedicated MCM forces. Previously, a varied assortment of U.S.-based assets had to be rushed to a crisis area and a local command structure established before any operation could commence. Now, as the punch-through capabilities of organic MCM assets are used to cope with the immediate mine threat, more deliberate planning can take place and a time-phased plan evolved to deliver the right supporting capability at the right place and time.

As dedicated forces deploy, naval commanders will have the option of placing them under the command structure of battle group MIWCs or deploying a larger MIWC staff to direct the entire, integrated effort. The arrangements will be determined as the dedicated assets deploy – the Navy has not yet chosen a definitive model. But no matter which option is chosen, the MIWC, staffed with the appropriate level of MCM expertise, will be able to fully exploit the capabilities of both the organic and dedicated systems, sensors, and platforms.

The dedicated MCM forces possess a broad capability to deal with enemy mines. They include national, strategic, and theater assets, especially in the areas of intelligence, surveillance and reconnaissance. Surface MCM platforms include *Avenger* (MCM-1)-class *Osprey* (MHC-51)-class mine-hunter and mine countermeasures ships. Aviation support can be provided by MH-53E Sea Dragon helicopters and their associated towed systems. Other support will be provided by EOD MCM and Very Shallow Water MCM Detachments; Marine Mammal Systems; Area Search Detachments; and Ordnance Clearance Detachments.

The capabilities of these dedicated MCM forces enable the MIWC to deal with a more extensive threat over a wider area than he could with only the organic forces originally on hand. However, the very nature of mine warfare and MCM also oblige the MIWC to develop a campaign plan that deals with the mine threat beyond the immediate requirements of the operation. Thus, while a CVBG or ARG Mine Warfare Commander will initially concentrate on using organic MCM forces to secure enough sea room to conduct an operation, once dedicated forces are deployed the MIWC must also expect to substantially clear the entire area of sea mines even after the crisis abates and combat operations are complete.

Moreover, in a large coalition operation the MIWC will likely employ allied MCM assets in addition to those of the United States. This type of operation requires the full integration of these highly capable assets – not merely as an adjunct to U.S. MCM forces – but as a critical contributor to the overall success of the MCM campaign. The MIWC works closely with the CVBG or ARG commander to ensure that the capabilities of allied MCM assets are fully exploited.

Grappling With the Inshore Threat

Even after eliminating offshore mines, naval expeditionary forces still must overcome the inshore underwater challenge. This involves the neutralization of mines and other obstacles that stretch from very shallow waters (40 feet or less), through the surf zone (10 foot water depths to the high-water mark) and onto the beach and the craft landing zone. Navy, Marine Corps, and even other joint forces must clear lanes through minefields in these areas to enable the surface assault phase of OMFTS – the tactical implementation known as *Ship to Objective Maneuver* (STOM) – and to permit over-the-shore logistical support to U.S. joint forces when a suitable port is not available.

The entire inshore area poses some of the more significant problems for effective MCM operations. It encompasses a complex oceanographic environment that hinders the effective performance of many mine countermeasure systems. Moreover, because inshore mine clearance occurs close to the beach and enemy shore defenses, conducting clandestine operations is a difficult undertaking. If spotted, vulnerable MCM forces can come under hostile fire, resulting in potentially heavy casualties and the loss of surprise.

Given these challenges, it is not surprising that the latest *U.S. Naval Mine Warfare Plan* acknowledged inshore mine warfare as an area where the naval services still had "significant shortcomings in near-term capability." Currently, human divers and marine mammals play a central role in
neutralizing these threats. However, the Navy's Very Shallow Water MCM Detachment under the Commander, Mine Warfare Command is working on several acquisition projects as part of a longer-term plan to acquire an expanded inshore capability.

In this detachment, as elsewhere, research efforts aim to ensure that naval expeditionary forces can project power seamlessly across the land-sea interface, even when a credible inshore mine threat challenge exists. Near-term objectives include reducing – and eventually eliminating – the vulnerability of divers and mammals through the use of unmanned underwater vehicles. For the long term, the Navy and Marine Corps are working on a range of systems to improve their capabilities for rapid minefield breaching operations. Even then, as the January 2000 *Mine Warfare Plan* noted, much more work needs to be done before inshore mines can be safely and reliably defeated.

C4ISR, the Critical Force Multiplier

Without proper intelligence and command and control, effective MCM – whether it entails preemption, punch-through, or dedicated force operations in the offshore or inshore environment – cannot occur. Effective C4ISR lies at the heart of mine warfare.

For preemption, effective ISR is needed to observe mine acquisition and stockpiling activity, the removal of mines from storage, and the transit of mines toward deployment so that U.S. forces can chart mine positions as they are laid or – preferably – destroy them at the appropriate time as crisis evolves into conflict. As in any offensive operation, ISR provides target composition and tracking information, information about enemy defenses, and post-action damage assessments.

Once mines have been laid, MIWCs must have in-depth intelligence about the mine threat to effectively negate it. The technical characteristics and likely operational employment patterns of possible hostile mines must be determined through various intelligence activities. ISR systems will be used to locate and define the boundaries of minefields and the distribution patterns of mines within them by observing mining activity, allowing U.S. forces to identify areas most likely to be free of these weapons. They also will assess environmental conditions and determine the best places in which to operate from an underwater sensor perspective. All of this, in turn, will allow U.S. and friendly forces to either avoid the minefields or, when necessary, concentrate available MCM assets to hunt, sweep, and neutralize them.[6] Good ISR will not always allow enemy minefields to be sidestepped or rapidly cleared, but in general makes mine warfare far more efficient and timely.

The ability to collect intelligence that battle groups, ARGs, and MCM forces can act upon represents only one aspect of the C4ISR capabilities U.S. forces need for mine warfare. The ability to disseminate this information and direct the employment of MCM forces is vital as well. Moreover, if countermine warfare is to be as important a consideration in naval expedi-

tionary operations as strike, surface, and undersea warfare, it too must be conducted in accordance with the network-centric concepts of operation now spreading throughout the Navy and Marine Corps.

Deriving its power from the exchange of information between networked, geographically dispersed warfighters, network-centric operations center on acquiring and maintaining an in-depth knowledge of the adversary, as well as gaining real-time situational awareness of enemy dispositions.[7] Once joint and allied forces move against an adversary, this knowledge of the enemy allows naval expeditionary forces to execute an overall-coordinated operational plan in a decentralized manner.[8]

Like other warfare areas, mine warfare lends itself to the same kind of knowledge-based combat activities. Thus, it cannot be treated as second-tier concern in the naval and joint-force C4ISR system. Instead, MIW activities need to be an integral part of that system, so that all levels of naval and joint command can have access to mine intelligence, early warnings, and tactical activities.[9]

The Road Ahead

The QDR emphasizes the need for new investments that would enable U.S. forces to defeat anti-access and area-denial threats and to operate effectively in critical areas. Such investments will include addressing the growing threat posed by mines.

Quadrennial Defense Review Report
September 30, 2001[10]

The Quadrennial Defense Report is clear in emphasizing the seriousness of anti-access threats, and particularly the threat posed by enemy mines. Assuring access to the contested littorals in the face of a determined adversary's mining capability will require a continuing transformation of our naval expeditionary forces' MCM capabilities. This implies both changes in technology and hardware, as well as in doctrine, operations, tactics, techniques, and procedures.

To date, progress in the transformation has been significant. Programs to develop the MCM equipment and platforms that will be assigned to carrier battle groups and amphibious ready groups are already nearing fruition. The newly implemented *Mine Warfare Concept of Operations* is providing the doctrinal framework for the "mainstreaming" of mine warfare knowledge throughout the Fleet.

Nevertheless, more needs to be accomplished if the naval services are to keep abreast of the burgeoning threat. Critically, every battle group's and ARG's Mine Warfare Commander needs the C4ISR wherewithal to ensure that all MCM operations will be network-centric efforts. Existing forces will need continuous upgrades – one immediate example is the need for a replacement ship for the countermeasures support ship USS *Inchon* (Mine Counter Measures Ship-MCS), which is aging, slow, and unable to support a full range of MCM activities. Research and development will likewise continue to be critical in mine warfare. As the Navy's

> *"There is perhaps no phase of warlike operations ashore or afloat in which the question of moral effect is so predominant as in the employment of engines of destruction below the surface of the sea. The fear of mines exerts an influence as great as do the mines themselves. Their position is unknown. Their existence may be a mere matter of conjecture, but the warship of today is much too valuable for it to be placed in the deadly peril which it incurs when it traverses a minefield controlled by a vigilant foe."*
>
> *Sir Charles E. Callwell, Military Operations and Maritime Preponderance, 1905*

most recent Mine Warfare Plan noted, increased investments are required in areas such as environmentally adaptive sensing, signal processing, underwater communications, and more.[11]

Also critical to the Navy's mine warfare efforts is the modernization of its force protection capabilities through the employment of improved point-defense measures, such as acoustic and magnetic signature reduction and control measures. Force protection must also include an effort to update the Navy's mining abilities by modernizing its aging stockpile of sea mines with a new family of remotely controlled full-water-depth mines that can be delivered by the entire range of air and sea platforms.

The continuing application of resources and effort, together with the innovative MIW Concept of Operations, doctrine, programs, and research, should help ensure that joint and coalition forces continue to have access to contested littoral regions anywhere in the world. Combining this MCM capability with the other warfare capabilities inherent in carrier battle groups and amphibious ready groups will allow the U.S. sea services – indeed, all U.S. and allied forces – to continue to project multi-dimensional combat power whenever and wherever necessary by assuring access in all the world's littorals.

Endnotes:

[1] Department of Defense, Quadrennial Defense Review Report (Washington: Department of Defense, 2001), p. 26.

[2] Department of the Navy, U.S. Naval Mine Warfare Plan, Fourth Edition (Washington: Department of the Navy, 2000)

[3] CINCLANTFLT RR 271403Z Jul 01 SBJ/MAINSTREAMING MINE WARFARE AND CVBG-ARG MIW CONOPS

[4] Naval Mine Warfare: Operational and Technical Challenges for Naval Forces, (Washington: National Academy Press, 2001), pp.1-3.

[5] Additional information on all systems mentioned in the paper can be found on the website of the Expeditionary Warfare Division (N75), Office of the Chief of Naval Operations, at http://www.exwar.org.

[6] Naval Mine Warfare pp. 2-12-13.

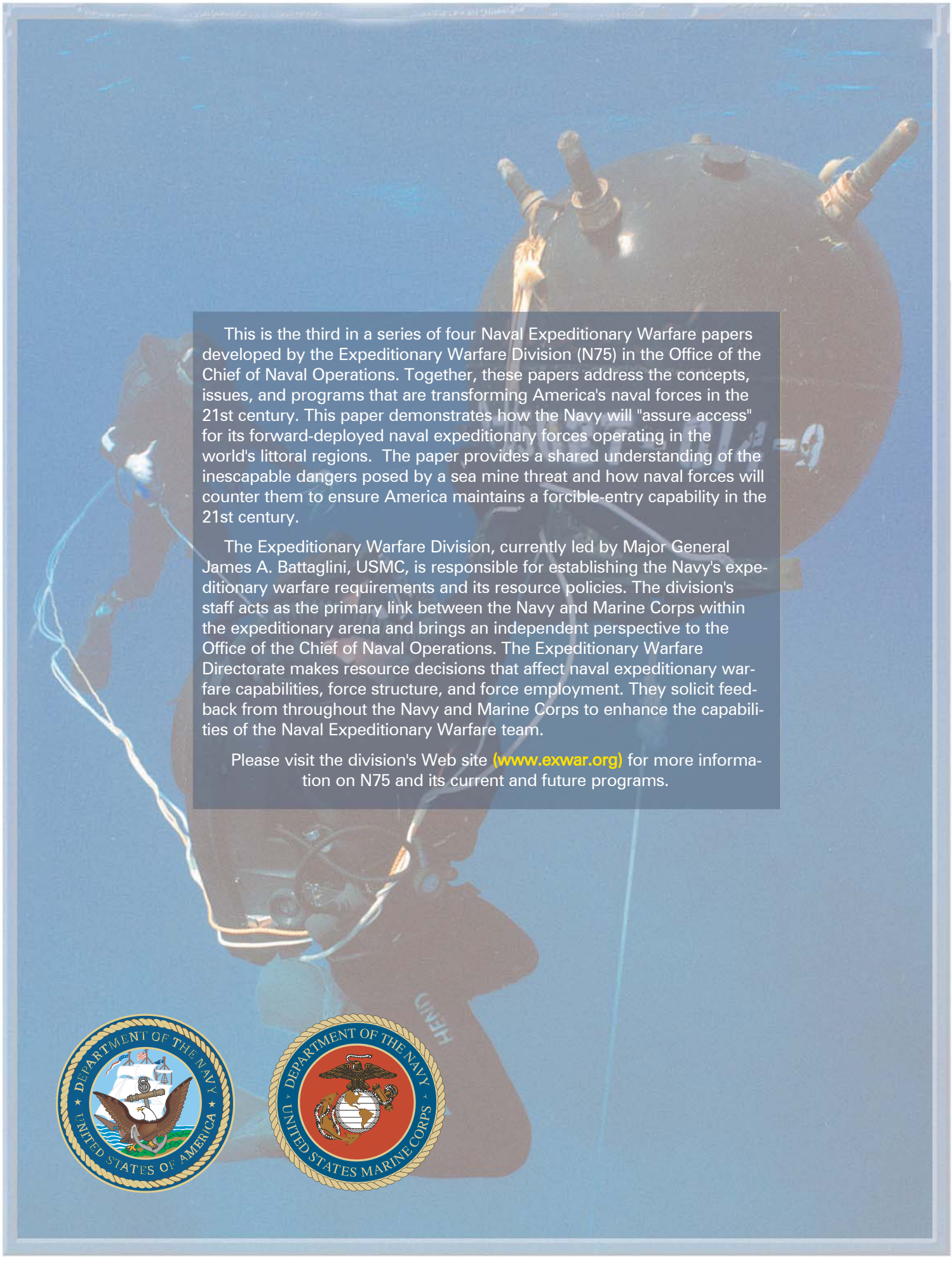
[7] Naval Studies Board, National Research Council, Network-Centric Naval Forces: A Transition Strategy for Enhancing Operational Capabilities, (Washington: National Academy Press, 2000),

[8] Naval Warfare Development Command, Network Centric Operations: A Capstone Concept for Naval Operations in the Information Age (Newport, Rhode Island: Navy Warfare Development Command, 2001).

[9] Naval Mine Warfare pp. 2-15.

[10] QDR, p. 43.

[11] U.S. Naval Mine Warfare Plan,



This is the third in a series of four Naval Expeditionary Warfare papers developed by the Expeditionary Warfare Division (N75) in the Office of the Chief of Naval Operations. Together, these papers address the concepts, issues, and programs that are transforming America's naval forces in the 21st century. This paper demonstrates how the Navy will "assure access" for its forward-deployed naval expeditionary forces operating in the world's littoral regions. The paper provides a shared understanding of the inescapable dangers posed by a sea mine threat and how naval forces will counter them to ensure America maintains a forcible-entry capability in the 21st century.

The Expeditionary Warfare Division, currently led by Major General James A. Battaglini, USMC, is responsible for establishing the Navy's expeditionary warfare requirements and its resource policies. The division's staff acts as the primary link between the Navy and Marine Corps within the expeditionary arena and brings an independent perspective to the Office of the Chief of Naval Operations. The Expeditionary Warfare Directorate makes resource decisions that affect naval expeditionary warfare capabilities, force structure, and force employment. They solicit feedback from throughout the Navy and Marine Corps to enhance the capabilities of the Naval Expeditionary Warfare team.

Please visit the division's Web site (www.exwar.org) for more information on N75 and its current and future programs.